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THE EFFECT OF FERTILIZER APPLICATIONS ON THE BIO-AVAILABILITY OF CD AND ZN

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Concentrations of heavy metals in soil solution determine their uptake by plants. The effect of fertilizers have been largely neglected in former experiments on the bio-availability of heavy metals and their concentrations in soil solution. An experiment was conducted to study the changes over time of the concentrations of Cd and Zn in soil solution and relate these to their uptake by radish plants.

Radish was grown under controlled conditions in soil that had been contaminated with heavy metals due to the past application of sewage sludge. Fertilizer solution (NH_4NO_3, KNO_3, $MgSO_4$) was added daily at a constant rate according to the total requirements of the plants in order to avoid the precipitation of $CaSO_4$ at the bottom of the pots. The soil was kept at 60% of the water holding capacity and daily water use by the plants was recorded. Over a period of 45 days, soil solution was obtained at 5 day intervals by displacement with water from three replicate pots. The plants were then cut and analysed.

The total fertilizer added equalled the plants' requirements at the final harvest but exceeded them during most of the experiment. Excess fertilizer concentrations were closely related to large increases in the concentrations of major and heavy metal ions in soil solutions and to a decrease in soil pH. Concentrations in the plant leaves reflected the increased concentrations of Cd and Zn in solution.

In order to study effects the plants have on metal solubility and to obtain a soil solution that has not been altered by the addition of fertilizers, nutrients must be added daily according to the growing needs of the plants. An example is shown where ion concentrations in soil solution remained constant over time by adding fertilizer according to the plant transpiration rate.

It is concluded that studies on the solubility and availability of heavy metals where fertilizers have been added in bulk and their effects not considered should be interpreted with caution.